

[0098] While a grip 500 of two integrated materials exhibiting the two different properties (rigid and flexible) can be very useful, it can be expensive to manufacture. As such, in alternative embodiments grip 500 may be manufactured from a single material for the sleeve 505, fingers 540 and webs 542 with the relative rigidity and flexibility produced through differing thicknesses at different points throughout the grip 500 of the one material rather than necessarily from different materials. For example, the interfaces between the webs 542 and the fingers 540 and flange 510 may incorporate less of the material than between the fingers 540 and the flange 510 thereby to permit webs 542 to be flexed relative to the flange 510 and fingers 540 more than the fingers 540 can flex relative to the flange 510. In this way, the resilience of fingers 540 with respect to flange 510 can be maintained while reducing the rigidifying effect of the webs 542 between the fingers 540.

[0099] FIG. 20 is a top plan view of the grip 500, FIG. 21 is a bottom plan view of the grip 500, FIG. 22 is a perspective bottom view of the grip 500, FIG. 23 is a perspective top view, partially sectioned, of the grip 500, FIG. 24 is a perspective bottom view, partially sectioned, of the grip 500, FIG. 25 is another perspective top view, partially sectioned below the horizontal components of the sleeve 505, the fingers 540 and the webs 542, of the grip 500, FIG. 26 is another perspective bottom view, partially sectioned, of the compression member of FIG. 18.

[0100] The radiopharmaceutical pigs 20 and 200 described and illustrated are particularly suitable for transporting radioactive substances such as liquid and solid radiopharmaceuticals due to the radioactivity-shielding character of the container 24, but can be adapted to transport other biohazardous products and materials without the use of radioactivity shielding by hermetically sealing the container 24.

[0101] Various embodiments of the present invention comprising been thus described in detail by way of example, it will be apparent to those skilled in the art that variations and modifications may be made without departing from the invention. The invention includes all such variations and modifications as fall within the scope of the appended claims.

[0102] For example, while embodiments described herein involve the compartment 24 of body 22 or body 220 being dimensioned to receive only a container of the biohazardous material, embodiments are contemplated in which the compartment 24 is dimensioned to receive a container in addition to a sponge, such as a cellulose sponge, for physically absorbing liquid originally contained within the received container should it escape from the container during transportation or other handling. Some regulators require that there be provided a quantity of sponge that is capable of absorbing twice the volume of liquid to be contained within the container. Such a cellulose sponge may be formed as a slab and positioned at the bottom of compartment 24 underneath the container, but may alternatively be formed as a cup having a bottom and a sleeve dimensioned to receive the container and, in turn, to be received within compartment 24. The cellulose sponge slab or sleeve would be a consumable.

[0103] Furthermore, while handle assembly depicted and describe herein has two struts, alternatives are contemplated having more than two struts, or other structures for encapsulating the body within the handle assembly.

[0104] Still further, very thin layers of rubber or other frictional material may be placed at the interfaces between collar 30a and cap closure 30b and collar 30a and body 22 in order to resist inadvertent relative movements when being transported to thereby resist inadvertent exposure to the contents of the container 10.

[0105] FIG. 27 is a perspective top view of another alternative compression member, or grip 600, for assisting in securing the container closure 14 to the cap 30. In the embodiment shown the grip 600 comprises a flange 610 being maintained in a spaced relation with an annulus 620 by pillars 630 extending between the annulus 620 and the flange 610. Spaced-apart pivotable grip components 640 are supported by annulus 620 and extend downwards from the annulus 620 between respective pillars 630 towards, but not into contact with, the flange 610. The pivotable grip components 640 are resiliently compressible inwardly against a container 10 and its closure 14 by compressive engagement of a complementary annulus 35 of the pig 20 into which the compression member 600 is dimensioned to be inserted, since the ends of the grip components 640 terminate between the annulus 620 and the flange 610 and are thus unattached. The outward-facing sides of the pivotable grip components 640 each incorporate ramps 642 that engage the complementary annulus and progressively urge the pivotable grip components 640 inwards towards a container 10 as grip 600 is, along with a container 10, urged further into annulus 35. Pillars 630 include additional buttresses 632 at their interfaces to flange 610 in order to strengthen their interconnection.

[0106] The pivotable grip components 640 and pillars 630 encircle a closure 14 and part of a neck 12 of a container 10 received within the interior of flange 610. This interaction with a closure 14 and part of a neck 12 of a container 10 is similar to that shown between grip 50 and container 10 in FIG. 11, except that, with grip 50, fingers 54 overlie the closure 14 whereas with grip 600, annulus 620 overlies the vial cap and the compressible grip components 640 do not.

[0107] Also, because pivotable grip components 640 depend from annulus 620 between the pillars 630 only partway, compression member 600 is, via the pivoting of the pivotable grip components 640, therefore able to apply more even force along the surface of a crimped vial closure 14. This provides an improved grip, and improved handling and radiation safety. In use, the grip 600 is placed atop of a crimped-top of a vial, and the corresponding portions of the pig in the annulus 35 of the pig that interact with the ramps 642 along the outward-facing sides of the pivotable grip components 640 as the compression member 600 (along with the container 10) are inserted therein cause the pivotable grip components 640 to move inwardly to grip the closure 14 of the container 10 and, in some embodiments, also contact the glass of the container 10. Grip 600 also serves as a spacer for between these portions of the container 10 and the pig 20.

[0108] In this embodiment, the above-described components of grip 600 are formed of a semi-compressible material such as plastic (such as a thermoplastic such as Delrin™ or polypropylene). In this embodiment, grip 600 is a single-piece component—a unitary structure—formed by machining. Furthermore, in this embodiment, flange 610 is not circular, but is instead substantially a square with significantly rounded corners 612. Furthermore, flange 610, as best seen in the side elevation view of FIG. 28, has a sloped edge